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Generation of a Single Pulse Particle Beam in the Laser Plasma Wake Field Accelerator RODOLFO GIACONE, Center for Integrated Plasma Studies, University of Colorado, JOHN CARY[1], Center for Integrated Plasma Studies, University of Colorado, CHET NIETER, Center for Integrated Plasma Studies, University of Colorado, DAVID BRUHWILER, Tech X Corporation, ERIC ESAREY, Center for Beam Physics, Ernest Orlando Lawrence Berkeley, WIM LEEMANS, Center for Beam Physics, Ernest Orlando Lawrence Berkeley A new all-optical laser injection mechanism that generates a single pulse, high quality electron beam is described. Particle-in-cell (PIC) simulations of different all-optical injection schemes proposed in the past for the generation of ultrashort electron bunches have failed in producing a single pulse electron beam. In all cases it was observed that a train of multiple beamlets was generated instead. In this paper we show that is possible to achieve a single pulse, high quality beam using two laser pulses propagating in the same direction. A first laser pulse creates a high intensity plasma wake field which allow particles get injected due to tranverse wave breaking. A second laser pulse propagating in the same direction of the pump is launched with specific phase and intensity to absorb part of the wake field generated by the first one after one wavelenght. Using the code VORPAL, two-dimensional PIC simulations of the proposed injection scheme were perfomed. The results of our simulations showed that is possible to obtain a high quality 50 MeV, 7.4 fs single electron bunch with energy spread of 1% and normalized emittance of 0.1 pi-mm-mrad.

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